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Performance and Nutrient Digestibility of Acha Grains (Digitaria iburua) as Replacement for Maize in the Diet of Female Grower Rabbits

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Abstract
Feed cost represents 60 - 80% of the total cost of rabbit production. Twenty seven (27) female grower rabbits of mixed breeds aged 10 weeks with weight range of 853.33g to 866.67g were used for this study. The animals were divided on weight equalisation into three treatment groups consisting of three inclusion levels of acha grains (0%, 50%, 100%). Data were collected on growth performance and nutrient digestibility. This study was conducted for a period of 70 days. Data were subjected to one way analysis of variance in a completely randomized design. Female grower rabbits fed 50% acha grain had higher ($p<0.05$) final weight gain (1800.00g). Female grower rabbits fed 50% acha grains had higher ($p<0.05$) crude fibre (67.35%) and dry matter digestibilities (76.33%). It can be concluded that replacement of maize with acha grains at 50% inclusion level can improve the performance and nutrient digestibility of female grower rabbits.
Keywords: Acha grain, maize, grower rabbits.

1. Introduction
The rabbit has immense potentials and good attributes which include high growth rate, high efficiency in converting forage to meat, short gestation period, and high prolificacy, relatively low cost of production, high nutritional quality of rabbit meat which includes low fat, sodium, and cholesterol levels. It also has a high protein level of about 20.8% and its consumption is bereft of cultural and religious biases (Biobaku and Oguntona, 1997). The presence of caecal microbes enables the rabbit to digest large amounts of fibrous feed as most non-ruminant species cannot (Taiwo *et al.,* 1999).

Acha protein is reported to be unique sequel to its high methionine content in relation to other cereal proteins (Jideani *et al.*, 1993). Two species of acha are high in digestible energy but low in oil and mineral. Nutrition experts have acknowledged it as exceptional. Its seed has high protein content of about 7.4% (Jideani *et al.,* 1993) and in some brown fonio samples, may be up to 11.8%. Acha grains are rich in methionine, cystine and other amino acids vital to human and animal health but deficient in today's major cereals; wheat, rice, maize, sorghum, barley and rye, some of which form the bulk of feed for monogastrics. The aim of the research is to determine the growth performance and nutrient digestibility of female grower rabbits.

2. Materials and Methods
2.1. Experimental Site
The experiment was carried out at the Rabbit Unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.

2.2. Experimental materials
The acha grains were sourced from Kenyi market, Kenyi town, Kaduna State, Nigeria. The grains were purchased and sun-dried to moisture contents of 10 percent and manually cleaned by hand picking of the chaffs, ground before incorporated into the experimental diets. Other feed ingredients were obtained from a reputable commercial feedmill.

2.3. Management of experimental animals
Twenty seven (27) rabbits of mixed breeds aged 10 weeks with weight range of 853.33g to 866.67g were divided on weight equalisation into three (3) treatment diets comprising of nine (9) animals each in a completely randomized design (CRD) consisting of three (3) inclusion levels of acha grains (0, 50%, 100%) for female rabbits. Each treatment was sub-divided into three replicates with three rabbit per replicate. The cages were prepared for the rabbit with the following practices which include; good sanitation and disinfection before the introduction of grower rabbits. The rabbits were fed with experimental diets for period of ten (10) weeks. Feeds and water were provided *ad libitum*. All routine management practices and medication were administered. Feed offered and feed leftovers were weighed every day for ten (10) weeks to estimate daily feed intake. The initial body weight was taken on the first day of the experiment and weekly thereafter in the morning before feeding the

rabbits.

2.4 Experimental diets

The acha grains were incorporated into the experimental diets at the rate of 0 %, 50 % and 100 % to replace maize in order to obtain diets 1, 2 and 3 for female grower rabbits. The composition of the experimental diets is shown on Table 1.

2.5 Data collection

2.5.1 Performance characteristics

The body weight, feed consumption and mortality rate were monitored and recorded for each replicate at weekly intervals to determine average feed intake, average body weight gain and feed conversion ratio.

2.5.2 Digestibility trial

At the end of ten weeks, three rabbits per treatment were selected and transferred into metabolic cages already cleaned and disinfected that were equipped with facilities for collection of faeces and urine for the digestibility trials. These rabbits were allowed to acclimatize for three days, before the commencement of the experiment while faecal collection was taken on daily basis for 3 days, weighed and oven dried at 60^{o}C for 24 hrs and bulked until they were required for analysis.

2.6 Statistical analysis

The data collected were subjected to one-way analysis of variance in a completely randomized design (CRD) arrangement. The significant means were separated and compared using Duncan Multiple Range Test (Duncan, 1955) of SAS (1999) at 5 % level of probability.

3. Results and Discussion

3.1 Growth performance of female grower rabbits.

The growth performance of the rabbits fed the experimental diets is shown in Table 2. There were no significant ($P>0.05$) differences in weight gain, daily weight gain, total feed consumed and daily feed intake. The final weight gain was significantly influenced ($P<0.05$) by the experimental diets and rabbits fed 50 % inclusion level of acha grains had the highest value (1800.00 g) while those fed 100 % acha grains recorded the least value (1566.67 g). The relative higher final weight gain of rabbits fed 50 % acha grains agreed with the report of Jideani and Akingbola (1993) that crude protein and amino acid profile in acha grains may stimulate a better growth response. The higher final weight gain (1800.00 g) by rabbits fed on *acha* diet, with a better feed conversion ratio (5.91) could be due to the high digestibility of the protein content of *acha*, making available more of the essential amino-acids necessary for growth. The daily feed intake ranged from 71.76 g to 81.35g. The total feed consumed ranged from 5023.33 g to 5694.50 g. Feed conversion ratio was significantly ($P<0.05$) different and 50 % acha grains had the best value (5.91) which is the lowest value.

3.2 Nutrient digestibility of female grower rabbits fed experimental diets

The nutrient digestibility of female grower rabbits fed the experimental diet is presented in Table 3. Significant differences ($P<0.05$) were observed in crude fibre digestibility and dry matter digestibility, the highest values were obtained from rabbits fed 50% acha grains while those fed 100% acha grains. The crude protein digestibility value ranged from 73.22 % to 75.05%. The crude fibre digestibility recorded higher value (67.35 %) with rabbits fed 50 % levels of replacement of acha grains while those fed 100 % acha grains had the lowest value (64.04 %). Rabbits fed 50 % acha grains had highest value (76.33 %) while those fed 100 % acha grains recorded the least value (72.99 %) for the dry matter digestibility. The results revealed that rabbits fed 50 % level of replacement of acha grains had higher values. This implies that rabbits that fell into this category utilize the acha grains that were included in their diets effectively than other treatments. Crude protein digestibility, ash digestibility and ether extract digestibility were not significantly ($P>0.05$) different.

4. Conclusion

Acha grains can replace maize up to 50 % with significant effect on the performance and nutrient digestibility of female grower rabbits.

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Table 1: Percentage composition of the experimental diets

	FEMALE RABBITS		
Ingredients	0%	50%	100%
Maize	40.00	20.00	0.00
Acha grain	0.00	20.00	40.00
Soybean meal	18.00	18.00	18.00
Fish meal (72% CP)	0.50	0.50	0.50
Wheat offal	39.00	39.00	39.00
Bone meal	2.00	2.00	2.00
Premix(Grower)	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated analysis			
$^{++}$ME(MJ/kg)	10.96	10.79	10.58
Crude protein(%)	18.19	18.23	18.27
Crude fibre (%)	11.94	11.43	10.92
Ether extract (%)	2.27	3.25	3.29
Calcium (%)	1.21	1.24	1.28
Phosphorus (%)	0.65	0.70	0.72

Table 2: Growth performance of female grower rabbits fed experimental diets

	Levels of replacement of acha grains			
Parameters	0%	50%	100%	SEM
Initial weight (g/rabbit)	866.67	860.00	853.33	38.99
Final Live weight (g/rabbit)	1720.00^{ab}	1800.00^{a}	1566.67^{b}	42.14
Weight gain (g/rabbit)	853.33	940.00	713.33	51.62
Daily weight gain (g/rabbit/day)	12.19	13.43	10.19	3.24
Total feed consumed (g/rabbit)	5694.50	5557.00	5023.33	152.47
Daily feed intake (g/rabbit)	81.35	79.39	71.76	2.18
Feed Conversion Ratio	6.67^{ab}	5.91^{b}	7.04^{a}	0.53
Mortality	0.00	0.00	11.11	0.84

^{ab} means on the same row having different superscript were significantly different (P<0.05).

Table 3: Nutrient digestibility of female grower rabbits fed experimental diet

	Levels of replacement of acha grains			
Parameters	0%	50%	100%	SEM
Crude protein digestibility (%)	74.11	75.05	73.22	0.39
Crude fibre digestibility (%)	65.10^{b}	67.35^{a}	64.04^{b}	0.51
Ash digestibility (%)	78.22	79.45	77.45	0.60
Ether extract digestibility (%)	74.23	74.44	72.30	0.43
Dry matter digestibility (%)	73.08^{ab}	76.33^{a}	72.99^{b}	1.15

^{ab} means on the same row having different superscripts were significantly different (P<0.05).